REMARKS

In the Office Action mailed August 10, 2006, the Examiner rejected claims 1-19 and objected to certain drawings and certain language in the specification requiring correction thereof. The Examiner further rejected claims 1-19 under § 112 as being indefinite and under § 101 as being directed to non-statutory subject matter. Finally, the Examiner rejected claims 1-13 under § 102(b) as having been anticipated by references originally cited by the applicant.

Several inadvertent typographical errors and unintentional omissions pointed out by the Examiner have been corrected. The drawing sheet labeled Fig. 10 has been replaced by a Replacement Sheet labeled Fig. 10. This Replacement Sheet adds numbering for items 7130 and 7140 to that Figure as was required by the Examiner in ¶ 2-1 of the First Office Action. The specification has been amended at line 5 of paragraph **[0005]** to change "at" to "an" in response to ¶ 3-1 of the First Office Action; line 3 of paragraph **[0026]** to add the words "at 2130" to correspond with Fig. 2 of the specification in response to ¶ 2-2 of the First Office Action; at line 22 of paragraph **[0029]** to change "5" to "8" in response to ¶ 3-2 of the First Office Action; and at line 12 of paragraph **[0039]** to change "use of the use of the method" to "use of the method" in response to ¶ 3-3 of the First Office Action.

The Examiner has rejected all of the claims based on § 112. In ¶ 5-1, he states that various limitations in claim 1 have no antecedent basis. The article prior to each such phrase has been changed from "the" to "a" to overcome this basis of rejection.

In ¶ 5-2, the Examiner has rejected claim 2 under § 112 for lack of support in the specification. Fig. 5 and spec., paragraph **[0011]**, lines 11-12 clearly show that flow vectors between "1" and "9", but omitting "5", are assigned, thus providing support for claim 2. However, lines 1 and 3 of paragraph **[0028]** in the specification have been

amended to correct a typographical error and make them consistent with Fig. 5 and paragraph [**0011**].

In ¶ 5-3, the Examiner has rejected claim 3 under § 112 for absence of an antecedent basis for "the center cell". Claim 3 has been amended to clarify that references to "neighbor" and "center" cells are to "neighbor minor" cells and to a "center minor" cell, both of which terms have an antecedent basis in the preamble and support in the specification.

In ¶ 5-4, the Examiner has rejected claim 4 under § 112 on the basis that various terms in claim 4 have no antecedent basis. The article prior to each such phrase has been changed from "the" to "a" to overcome this basis of rejection.

In ¶ 5-5, the Examiner has rejected claim 14 under § 112 for failure to provide an antecedent basis to the term "the D8 method" in the preamble of the claim. The article prior to this phrase has been changed from "the" to "a" to overcome this basis of rejection.

In ¶ 5-6, the Examiner has rejected claim 14 on the basis of ambiguity in a phrase relating to random selection of a potential path. Claim 14 has been amended to clarify that phrase.

In ¶¶ 6 through 7-2, the Examiner has rejected claims 1-19 under § 101 as being directed to non-statutory subject matter in that no practical application producing useful, tangible results is shown. This rejection has been overcome by amending independent claims 1, 4 and 14 to clarify that applicant's method is implemented on a computer having a memory storing data relating to hydraulic and hydrologic conditions. Various steps in that method result in altering the memory of that computer. Altering the memory of a computer in itself constitutes physical transformation of an object to another state and therefore constitutes patentable subject matter. The claims amendments also clarify the

practical application (determining water flow paths in a watershed based on hydraulic and hydrologic conditions) for which the flow vectors produced by applicant's process may be used. The specification in paragraph [**0002**] states applicant's method is used for this purpose. In addition, paragraph [**0011**], lines 26-29, discloses that "These flow vectors can be used for a variety of purposes including, but not limited to, basin delineation, time of concentration calculation, flowpath tracing, drainage area calculation, determination of the extents of hazardous waste spills and streamline generation." Furthermore, in ¶ 7-1, the Examiner stated that in Fig. 7, unfixable conditions exist for fixing depressions. Applicant's method does not ignore such situations. Instead, it handles them by resetting the highest depression variable at 4020 and looking for the next highest depression at 4030. (Spec., pg. 14, para. 29).

In ¶¶ 8, 9, and 9-1, the Examiner rejects claim 1 under § 102(b) as being anticipated by Garbrecht et al. which discloses a method for processing a watershed in a single, large array. Claim 1 has been amended to clarify that applicant's method is applicable to watersheds divided into **more than one** array. One of the limitations of previously known methods limited to a single array, such as Garbrecht et al., is that as the array size grows to reflect a larger watershed, computer memory requirements are eventually exceeded. That is why applicant's method uses a series of major cells to subdivide a watershed.   As stated in the TOPAZ user's manual (available online at http://www.ars.usda.gov/Research/docs.htm?docid=7837#od):

> "RAM memory and disk storage requirements for TOPAZ depend on the size of the application DEM. Minimum recommended RAM memory is 8 mega-bytes which is adequate for DEM raster of 500 rows and columns or smaller. For applications with DEMs having over 500 rows and columns, the size of the RAM memory to run TOPAZ can be roughly approximated by the following equation.

$$MEM = 25*(NROW*NCOL) / 1048000$$

Where MEM is about the required RAM memory in mega-bytes (+-10%), NROW and NCOL is the DEM size specified in the program input file."

In ¶ 9-2, the Examiner rejects claims 2 and 3 as being anticipated by Garbrecht et al. since the cited reference discloses modifying a flat surface using the D8 method. However, Garbrecht et al. is limited to processing flat areas. (See Garbrecht et al., pg. 206, ¶ 2, last two sentences: "It is re-emphasized that the elevation increment is applied only to DEM cells within the flat surfaces. No DEM elevations outside flat surfaces are altered.") By contrast, applicant claims a method for processing flat areas, depressions and peaks in multiple cells as well as fixes for each of these types of problems. Furthermore, in Garbrecht et al., cells appear to be processed in a preset order based on adjacency. There is no storing of problem types nor sorting based on elevation as occurs in applicant's method.

In ¶¶ 10 and 10-1, the Examiner rejects claims 4-13 under § 102(b) as being anticipated by Martz et al. However the breaching algorithm used by Martz et al. differs distinctly from that used by the applicant. First, the cited breaching algorithm is only attempting to fix small spurious depressions caused by overestimation or underestimation of the elevations in the source data. It is not attempting to fix any man-made depressions, such as culvert crossings. Applicant's method was designed to fix both small spurious depressions and large man-made obstructions to flow. Second, in order to limit the impact of the Martz et al. algorithm, the breaching length is limited to 2 minor cells maximum. Applicant's method accomplishes breaching completely differently – it examines the potential outlet, and then traces a flow path downstream (using the D8 method) until it hits an elevation lower than the original depression elevation. Once this has been found, a line from the original depression to the potential outlet to this lower end

point is burned into the terrain. This requires many minor cells – the limitation of 2 would not work. This is demonstrated at step 6290 of Fig. 9C in the applicant's specification.   Third, the cited algorithm does not attempt to link the original depression to the final outlet – it limits its breach to 2 cells, which in effect only creates a notch in the top of the depression, not a breach that extends all the way down into the depression. Applicant's method starts the breach at the depression itself. This is demonstrated at step 6280 of Fig. 9C in applicant's specification. Fourth, the cited algorithm still fills depressions once it has created the 2-cell breach. This goes against the core purpose of applicant's method – there is no filling of sinks whatsoever in applicant's method. Fifth, there is no mention in TOPAZ anywhere of a maximum depth depression to fix, or a maximum size flat area to process. The only user input parameter relates to whether TOPAZ should breach one minor cell or two. Finally, claim 4 has been amended to clarify that applicant's method applies to "**more than one** predefined, rectangular major cell" thus further differentiating it from Martz et al.

In view of the arguments presented above and the amendments to independent claims 1, 4 and 14 and to dependent claim 3, it is respectfully suggested that claims 1-19 are now in condition for allowance and it is respectfully requested that they be so allowed.

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